

Amendments to the Claims

Please cancel claims 1-7 and 21-40.

41. An apparatus for machining holes in crankshafts at various angular positions about a longitudinal axis through the crankshaft and at various tilt angles to the rotational axis, comprising:

a frame;

a rotational means on the frame for supporting a crankshaft and for rotating the crankshaft about the crankshaft's longitudinal axis to present different angular positions for the machining of holes;

a machine head mounted on the frame with a tool, movable along a plunging axis to present the tool to the crankshaft to machine holes therein;

tilt means on the frame mounting the crankshaft to tilt the crankshaft at various angles to the plunging axis so that holes may be machined at various rotational positions about the crankshaft and at various tilt angles to its longitudinal axis;

wherein rotational means comprises a crankshaft supporting fixture, means in the fixture mounting the crankshaft for turning about the rotational axis of the crankshaft within the fixture;
and

wherein the tilt means includes pivot means on the frame for pivotally mounting the fixture to pivot relative to the plunging axis.

42. The apparatus of Claim 41 wherein a slide means of the machine frame guides the machine head for travel along the plunging axis, another slide means of the machine frame guides the machine head for travel along a first positioning axis normal to the plunging axis, and another slide means of the machine frame guides the machine head for travel along a second positioning axis that is normal to both the first positioning axis and the plunging axis.

43. An apparatus for machining holes in crankshafts at various angular positions about a longitudinal axis through the crankshaft and at various tilt angles to the rotational axis, comprising:

a frame;

a rotational means on the frame for supporting a crankshaft and for rotating the crankshaft about the crankshaft's longitudinal axis to present different angular positions for the machining of holes;

a machine head mounted on the frame with a tool, movable along a plunging axis to present the tool to the crankshaft to machine holes therein;

tilt means on the frame mounting the crankshaft to tilt the crankshaft at various angles to the plunging axis so that holes may be machined at various rotational positions about the crankshaft and at various tilt angles to its longitudinal axis; and

means for storing a plurality of tools and tool support bushings, adjacent the machine head for automatic transfer of different tools to the machine head.

44. An apparatus for machining holes in crankshafts at various angular positions about a longitudinal axis through the crankshaft and at various tilt angles to the rotational axis, comprising:

a frame;

a rotational means on the frame for supporting a crankshaft and for rotating the crankshaft about the crankshaft's longitudinal axis to present different angular positions for the machining of holes;

a machine head mounted on the frame with a tool, movable along a plunging axis to present the tool to the crankshaft to machine holes therein;

tilt means on the frame mounting the crankshaft to tilt the crankshaft at various angles to the plunging axis so that holes may be machined at various rotational positions about the crankshaft and at various tilt angles to its longitudinal axis; and

means for positioning a tool support bushing in correct position between the crankshaft and the tool.

45. An apparatus for machining holes in crankshafts at various angular positions about a longitudinal axis through the crankshaft and at various tilt angles to the rotational axis, comprising:

a frame;

a rotational means on the frame for supporting a crankshaft and for rotating the crankshaft about the crankshaft's longitudinal axis to present different angular positions for the machining of holes;

a machine head mounted on the frame with a tool, movable along a plunging axis to present the tool to the crankshaft to machine holes therein;

tilt means on the frame mounting the crankshaft to tilt the crankshaft at various angles to the plunging axis so that holes may be machined at various rotational positions about the crankshaft and at various tilt angles to its longitudinal axis;

wherein a second rotational means is provided on the fixture for supporting a second crankshaft for synchronous rotational positioning of the second crankshaft with the first crankshaft; and

a second machine head is provided having a tool, synchronously movable with the first machine head along the plunging axis to present tools to the pair of crankshafts after the crankshafts have been rotatably positioned and tilted relative to the plunging axis.

46. An apparatus for machining holes in crankshafts at various angular positions about a longitudinal axis through the crankshaft and at various tilt angles to the rotational axis, comprising:

a frame;

a rotational means on the frame for supporting a crankshaft and for rotating the crankshaft about the crankshaft's longitudinal axis to present different angular positions for the machining of holes;

B1 a machine head mounted on the frame with a tool, movable along a plunging axis to present the tool to the crankshaft to machine holes therein;

tilt means on the frame mounting the crankshaft to tilt the crankshaft at various angles to the plunging axis so that holes may be machined at various rotational positions about the crankshaft and at various tilt angles to its longitudinal axis; and

wherein pivot means on the frame are provided and the tilt means comprise a fixture mounted on the pivot means for tilting about an axis through the pivot means.
